CHI MEI OPTOELECTRONICS CORP.

Doc No.: 400037971
Issued Date: Nov, 16, 2009
Model No.: N140B6 - L06
Approval

TFT LCD Approval Specification

MODEL NO.: N140B6 - L06

Customer : Lenovo China

Approved by : _____

Note :

核准時間	部門	審核	角色	投票
2009-12-01 21:37:07	NB 產品管理處	楊 2009.12.01 竣 傑	Director	Accept

Version 3.1

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Version 3.1

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 3.0	Jul. 21,'09	All	All	Approval specification first issued.
Ver 3.1	Nov. 16,'09	4	1.5	Update mechanical specification
		7~8	3.1	Update Note (2)
		10	3.2	Update Note (3)
		12	5.1	Update Connector Part No.
		16~18	5.4	EDID delete 40Hz timing.
		19	6	Update converter specification
		23	7.2	Update Note (1) ~ (4)
		24	8.2	Update optical specification
		33	12	Update mechanical drawing

1 GENERAL DESCRIPTION

1.1 OVERVIEW

N140B6-L06 is a 14.0" TFT Liquid Crystal Display module with LED Backlight unit and 40 pins LVDS interface. This module supports 1366 x 768 HD mode and can display 262,144 colors. The optimum viewing angle is at 6 o'clock direction.

1.2 FEATURES

- HD (1366 x 768 pixels) resolution
- 3.3V LVDS (Low Voltage Differential Signaling) interface with 1 pixel/clock
- WLED
- LED converter embedded

1.3 APPLICATION

- TFT LCD Notebook

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	309.40 (H) x 173.95 (V) (14.0" diagonal)	mm	(1)
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1366 x R.G.B. x 768	pixel	-
Pixel Pitch	0.2265 (H) x 0.2265 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	262,144	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Hard coating (3H), glare type	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	319.9	320.4	320.9	mm	(1)
	Vertical(V) W/o PCB and Bracket	186.6	187.1	187.6	mm	
	Vertical(V) With PCB W/o Bracket	198.1	198.6	199.1	mm	
	Vertical(V) With PCB and Bracket	204.6	205.1	205.6	mm	
	Thickness(T)	-	3.3	3.6	mm	
Weight		-	310	325	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2.ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

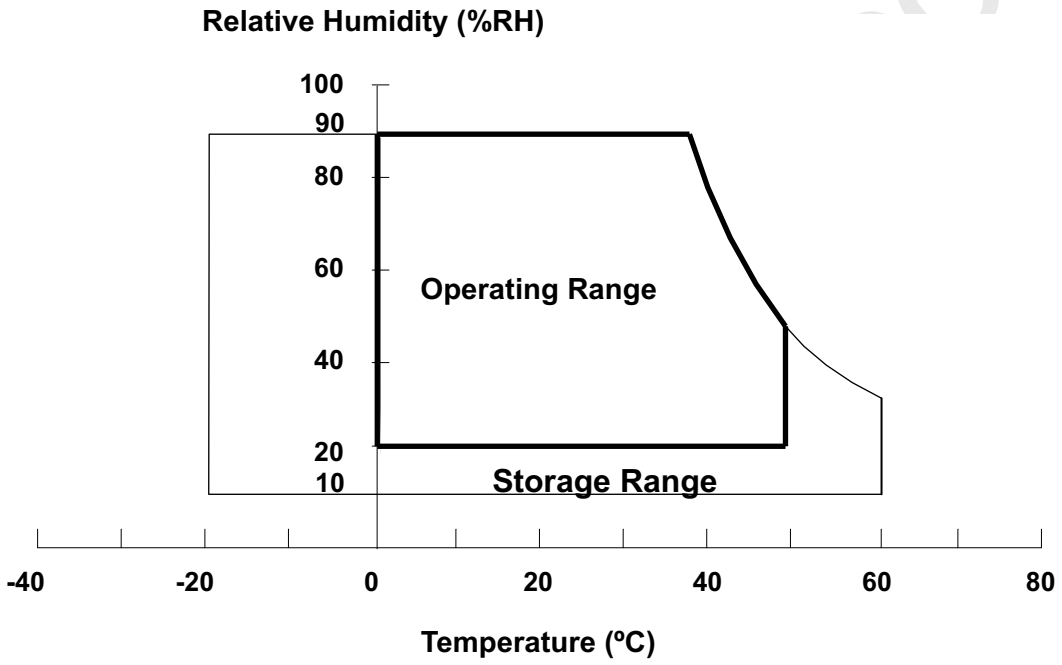
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	220/2	G/ms	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.5	G	(4), (5)

Note (1) (a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel display surface area should be 0 ºC Min. and 50 ºC Max.



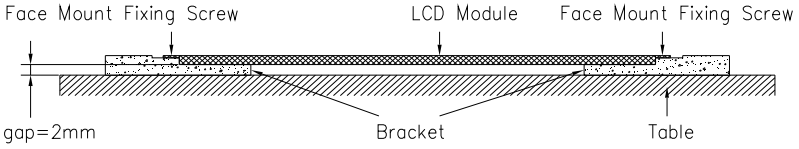
Note (3) 1 time for ± X, ± Y, ± Z. for Condition (220G / 2ms) is half Sine Wave,.

Note (4) 10 ~ 500 Hz, 30 min/cycle,1cycles for each X, Y, Z axis.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

The fixing condition is shown as below:

At Room Temperature



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	+4.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	Vcc+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
LED Light Bar Power Supply Voltage	V_L	-40	28	V	(1), (2)
LED Light Bar Power Supply Current	I_L	0	125	mA	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED (Refer to Section 3.2 for further information).

3.ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

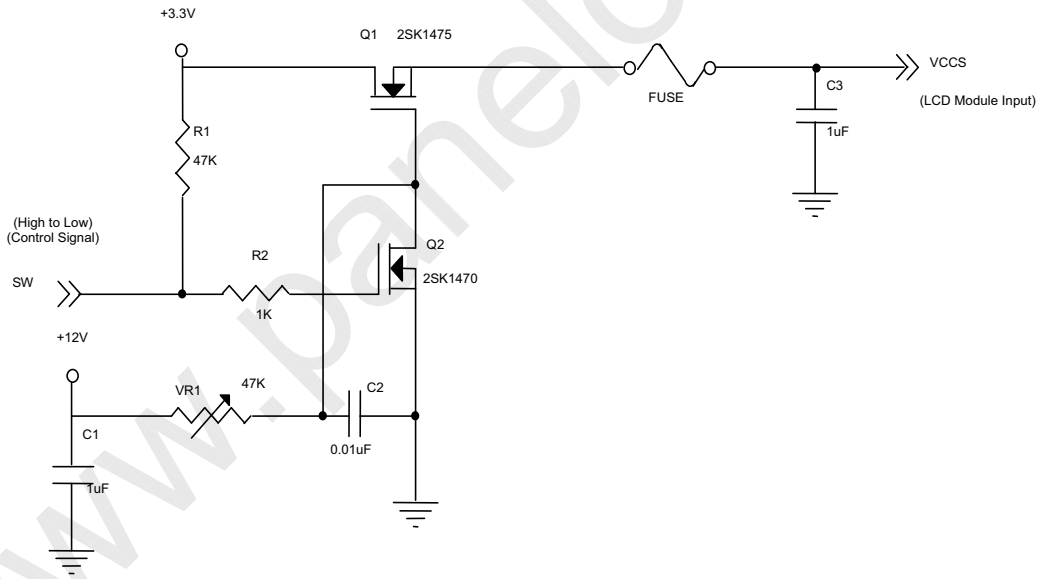
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	-
Ripple Voltage		V_{RP}	-	50		mV	-
Rush Current		I_{RUSH}	-		1.5	A	(2)
Initial Stage Current		I_{IS}			1.0	A	(2)
Power Supply Current	White	Icc	-	230	250	mA	(3)a
	Black		-	320	350	mA	(3)b
LVDS Differential Input High Threshold		$V_{TH(LVDS)}$			+100	mV	(5), V_{CM}=1.2V
LVDS Differential Input Low Threshold		$V_{TL(LVDS)}$	-100			mV	(5) V_{CM}=1.2V
LVDS Common Mode Voltage		V_{CM}	1.125		1.375	V	(5)
LVDS Differential Input Voltage		$\|V_{ID}\|$	100		600	mV	(5)
LVDS Terminating Resistor		R_T	-	100	-	Ohm	-
Power per EBL WG		P_{EBL}	-	1.82		W	(4)

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

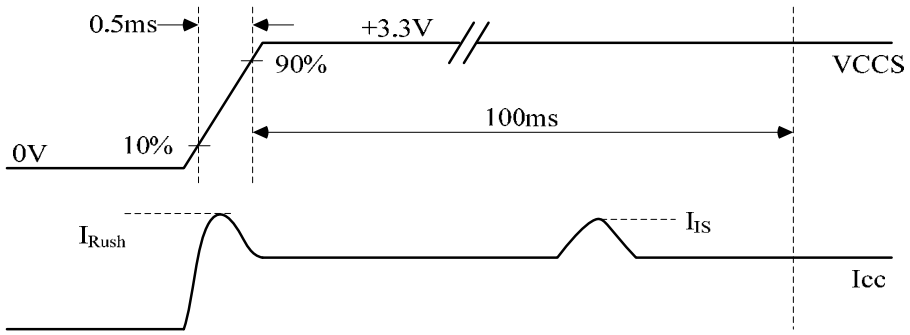
Note (2) I_{RUSH}: the maximum current when VCCS is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.



VCCS rising time is 0.5ms



Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, Ta = 25 ± 2 ºC, DC Current and f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

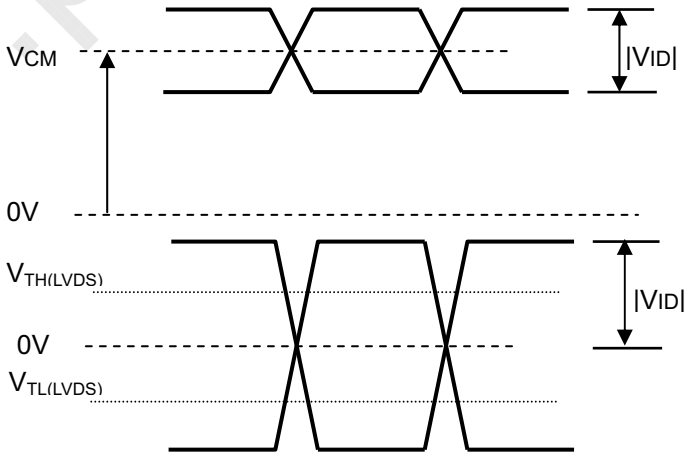
b. Black Pattern

Active Area

Note (4) The parameters of LVDS signals are defined as the following figures.

Single Ended

Differential



Note (5) The specified power are the sum of LCD panel electronics input power and the converter input power. Test conditions are as follows.

(a) VCCS = 3.3 V, Ta = 25 ± 2 ºC, f_v = 60 Hz,

(b) The pattern used is a black and white 32 x 36 checkerboard, slide #100 from the VESA file "Flat Panel Display Monitor Setup Patterns", FPDMSU.ppt.

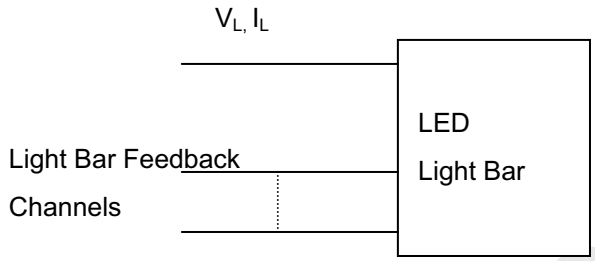
(c) Luminance: 60 nits.

3.2 BACKLIGHT UNIT

Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar input Voltage	V_L	22.4	25.6	28	V	(1) Duty 100%
LED Light Bar input Current	I_L	95	100	105	mA	
Power Consumption	P_L	2.128	2.56	2.94	W	(3) I_L= 100 mA Duty=100%
LED Life Time	L_{BL}	12000			Hrs	(4)

Note (1) LED light bar configuration is shown as below.



Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3) $P_L = I_L \times V_L$

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ± 2°C and I_L = 20.0mA (Per EA) until the brightness becomes ≦ 50% of its original value.

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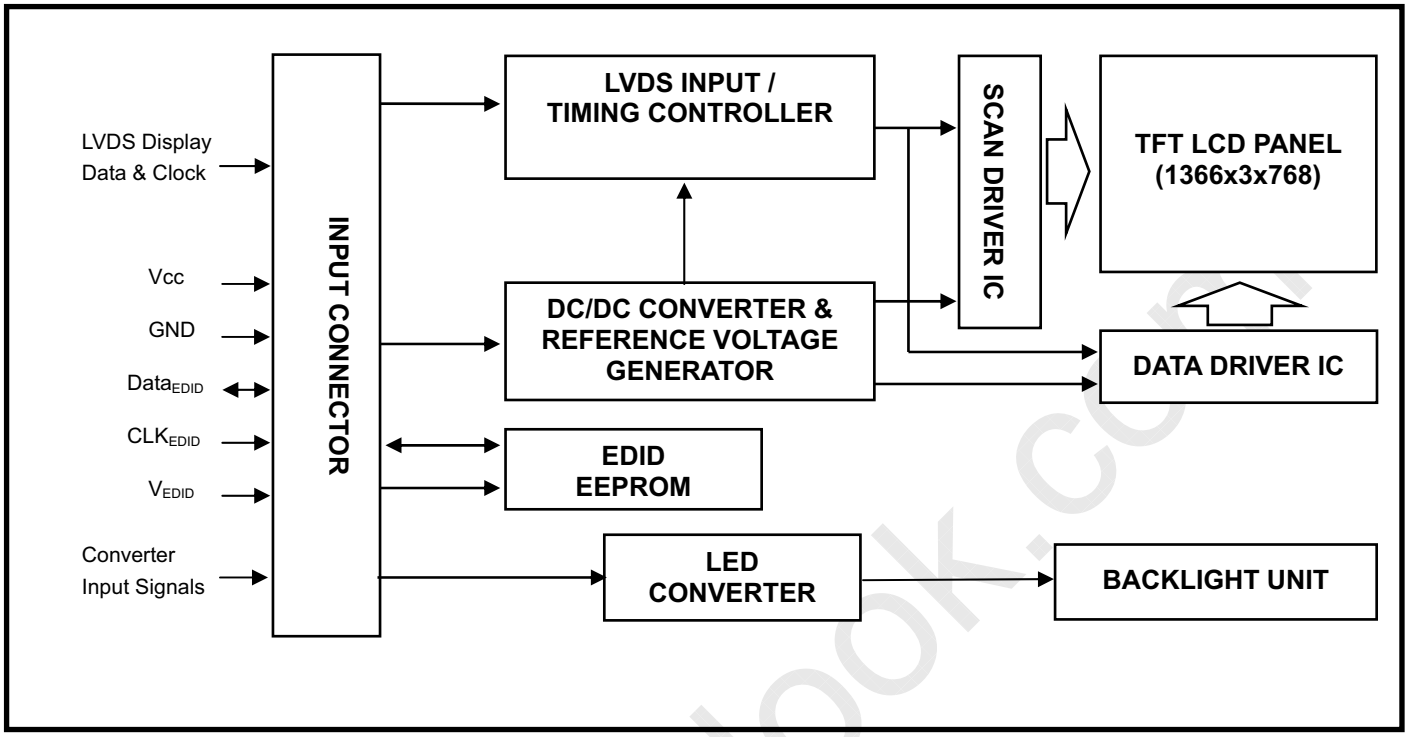
4.BLOCK DIAGRAM

4.1 TFT LCD MODULE



5.INPUT TERMINAL PIN ASSIGNMENT

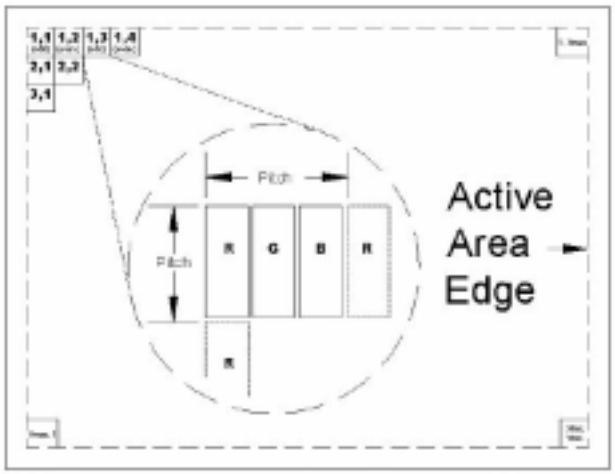
5.1 TFT LCD MODULE

Pin	Symbol	Description	Polarity	Remark
1	NC	No Connection (Reserve)		
2	VCCS	Power Supply (3.3V typ.)		
3	VCCS	Power Supply (3.3V typ.)		
4	VEDID	DDC 3.3V power		
5	NC	No Connection (Reserved for CMO test)		
6	CLKEDID	DDC clock		
7	DATAEDID	DDC data		
8	Rxin0-	LVDS differential data input	Negative	R0-R5, G0
9	Rxin0+	LVDS differential data input	Positive	
10	VSS	Ground		
11	Rxin1-	LVDS differential data input	Negative	G1~G5, B0, B1
12	Rxin1+	LVDS differential data input	Positive	
13	VSS	Ground		
14	Rxin2-	LVDS Differential Data Input	Negative	B2-B5,HS,VS, DE
15	Rxin2+	LVDS Differential Data Input	Positive	
16	VSS	Ground		
17	RxCLK-	LVDS differential clock input		
18	RxCLK+	LVDS differential clock input		
19	VSS	Ground		
20	NC	No Connection (Reserve)		
21	NC	No Connection (Reserve)		
22	VSS	Ground		
23	NC	No Connection (Reserve)		
24	NC	No Connection (Reserve)		
25	VSS	Ground		
26	NC	No Connection (Reserve)		
27	NC	No Connection (Reserve)		
28	VSS	Ground		
29	NC	No Connection (Reserve)		
30	NC	No Connection (Reserve)		
31	LED_GND	LED Ground		
32	LED_GND	LED Ground		
33	LED_GND	LED Ground		
34	NC	No Connection (Reserve)		
35	LED_PWM	PWM Control Signal of LED Converter		
36	LED_EN	Enable Control Signal of LED Converter		
37	NC	No Connection (Reserve)		
38	LED_VCCS	LED Power		
39	LED_VCCS	LED Power		
40	LED_VCCS	LED Power		

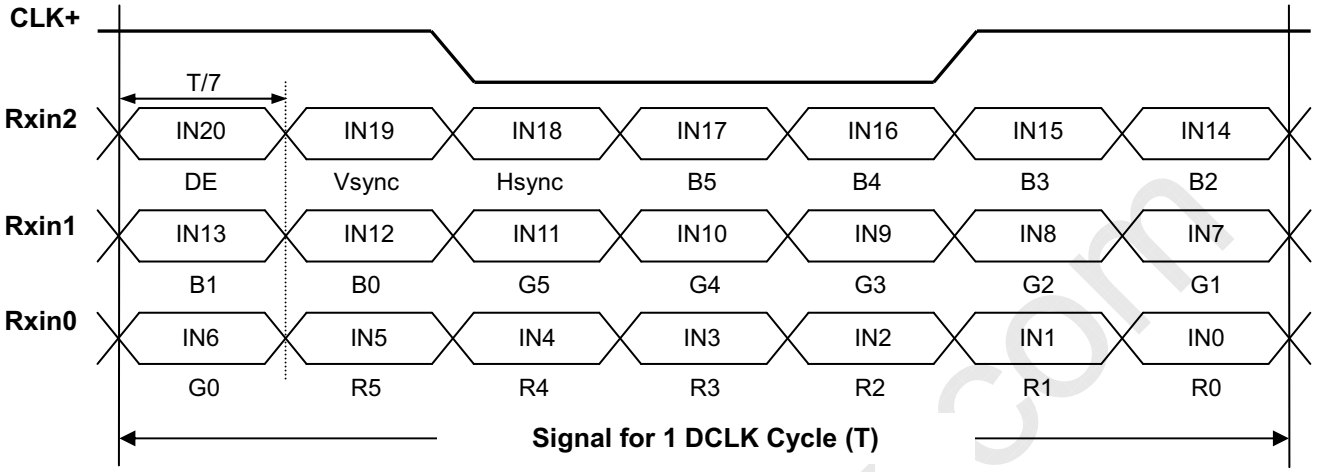
Note (1) Connector Part No.: I-PEX 20455-040E-12, Tyco 2069716-3,or Starconn 111A40-0000RA-G3.

Note (2) User's connector Part No.: I-PEX 20453-040T-01 or equivalent

Note (3) The first pixel is odd as shown in the following figure.



5.2 TIMING DIAGRAM OF LVDS INPUT SIGNAL



5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Basic	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
Colors	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Red	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Gray	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Green	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Gray	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Blue	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

5.4 EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPDI standards.

Byte # (decimal)	Byte # (hex)	Field Name and Comments	Value (hex)	Value (binary)
0	0	Header	00	00000000
1	1	Header	FF	11111111
2	2	Header	FF	11111111
3	3	Header	FF	11111111
4	4	Header	FF	11111111
5	5	Header	FF	11111111
6	6	Header	FF	11111111
7	7	Header	00	00000000
8	8	EISA ID manufacturer name (“CMO”)	0D	00001101
9	9	EISA ID manufacturer name (Compressed ASCII)	AF	10101111
10	0A	ID product code (N140B6-L06)	51	01010001
11	0B	ID product code (hex LSB first; N140B6-L06)	14	00010100
12	0C	ID S/N (fixed “0”)	00	00000000
13	0D	ID S/N (fixed “0”)	00	00000000
14	0E	ID S/N (fixed “0”)	00	00000000
15	0F	ID S/N (fixed “0”)	00	00000000
16	10	Week of manufacture (fixed week code)	0C	00001100
17	11	Year of manufacture (fixed year code)	13	00010011
18	12	EDID structure version # (“1”)	01	00000001
19	13	EDID revision # (“3”)	03	00000011
20	14	Video I/P definition (“digital”)	80	10000000
21	15	Active area horizontal 30.94 cm	1F	00011111
22	16	Active area vertical 17.40 cm	11	00010001
23	17	Display Gamma (Gamma = ”2.2”)	78	01111000
24	18	Feature support (“Active off, RGB Color”)	0A	00001010
25	19	Red/Green (Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	BA	10111010
26	1A	Blue/White (Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	C5	11000101
27	1B	Red-x (Rx = “0.580”)	94	10010100
28	1C	Red-y (Ry = “0.343”)	57	01010111
29	1D	Green-x (Gx = ”0.330”)	54	01010100
30	1E	Green-y (Gy = ”0.568”)	91	10010001
31	1F	Blue-x (Bx = ”0.155”)	27	00100111
32	20	Blue-y (By = ”0.125”)	20	00100000
33	21	White-x (Wx = ”0.313”)	50	01010000
34	22	White-y (Wy = ”0.329”)	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Manufacturer’s reserved timings	00	00000000
38	26	Standard timing ID # 1	01	00000001
39	27	Standard timing ID # 1	01	00000001
40	28	Standard timing ID # 2	01	00000001
41	29	Standard timing ID # 2	01	00000001

42	2A	Standard timing ID # 3	01	00000001
43	2B	Standard timing ID # 3	01	00000001
44	2C	Standard timing ID # 4	01	00000001
45	2D	Standard timing ID # 4	01	00000001
46	2E	Standard timing ID # 5	01	00000001
47	2F	Standard timing ID # 5	01	00000001
48	30	Standard timing ID # 6	01	00000001
49	31	Standard timing ID # 6	01	00000001
50	32	Standard timing ID # 7	01	00000001
51	33	Standard timing ID # 7	01	00000001
52	34	Standard timing ID # 8	01	00000001
53	35	Standard timing ID # 8	01	00000001
54	36	Detailed timing description # 1 Pixel clock (“72.12MHz”, According to VESA CVT Rev1.1)	2C	00101100
55	37	# 1 Pixel clock (hex LSB first)	1C	00011100
56	38	# 1 H active (“1366”)	56	01010110
57	39	# 1 H blank (“144”)	90	10010000
58	3A	# 1 H active : H blank (“1366 : 144”)	50	01010000
59	3B	# 1 V active (”768”)	00	00000000
60	3C	# 1 V blank (”28”)	1C	00011100
61	3D	# 1 V active : V blank (”768 :28”)	30	00110000
62	3E	# 1 H sync offset (”23”)	17	00010111
63	3F	# 1 H sync pulse width ("48”)	30	00110000
64	40	# 1 V sync offset : V sync pulse width (”3 : 9”)	39	00111001
65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width (”23: 48 : 3 : 9”)	00	00000000
66	42	# 1 H image size (”309 mm”)	35	00110101
67	43	# 1 V image size (”174 mm”)	AE	10101110
68	44	# 1 H image size : V image size (”309 : 174”)	10	00010000
69	45	# 1 H boarder (”0”)	00	00000000
70	46	# 1 V boarder (”0”)	00	00000000
71	47	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
72	48	Detailed timing description # 2	00	00000000
73	49	# 2 Flag	00	00000000
74	4A	# 2 Reserved	00	00000000
75	4B	# 2 FE (hex) defines ASCII string (Model Name “N140B6-L06”, ASCII)	FE	11111110
76	4C	# 2 Flag	00	00000000
77	4D	# 2 1st character of name (“N”)	4E	01001110
78	4E	# 2 2nd character of name (“1”)	31	00110001
79	4F	# 2 3rd character of name (“4”)	34	00110100
80	50	# 2 4th character of name (“0”)	30	00110000
81	51	# 2 5th character of name (“B”)	42	01000010
82	52	# 2 6th character of name (“6”)	36	00110110
83	53	# 2 7th character of name (“-”)	2D	00101101
84	54	# 2 8th character of name (“L”)	4C	01001100
85	55	# 2 9th character of name (“0”)	30	00110000
86	56	# 2 9th character of name (“6”)	36	00110110

87	57	# 2 New line character indicates end of ASCII string	0A	00001010
88	58	# 2 Padding with “Blank” character	20	00100000
89	59	# 2 Padding with “Blank” character	20	00100000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string (Vendor “CMO”, ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of string (“C”)	43	01000011
96	60	# 3 2nd character of string (“M”)	4D	01001101
97	61	# 3 3rd character of string (“O”)	4F	01001111
98	62	# 3 New line character indicates end of ASCII string	0A	00001010
99	63	# 3 Padding with “Blank” character	20	00100000
100	64	# 3 Padding with “Blank” character	20	00100000
101	65	# 3 Padding with “Blank” character	20	00100000
102	66	# 3 Padding with “Blank” character	20	00100000
103	67	# 3 Padding with “Blank” character	20	00100000
104	68	# 3 Padding with “Blank” character	20	00100000
105	69	# 3 Padding with “Blank” character	20	00100000
106	6A	# 3 Padding with “Blank” character	20	00100000
107	6B	# 3 Padding with “Blank” character	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
111	6F	# 4 FE (hex) defines ASCII string (Model Name“N140B6-L06”, ASCII)	FE	11111110
112	70	# 4 Flag	00	00000000
113	71	# 4 1st character of name (“N”)	4E	01001110
114	72	# 4 2nd character of name (“1”)	31	00110001
115	73	# 4 3rd character of name (“4”)	34	00110100
116	74	# 4 4th character of name (“0”)	30	00110000
117	75	# 4 5th character of name (“B”)	42	01000010
118	76	# 4 6th character of name (“6”)	36	00110110
119	77	# 4 7th character of name (“-”)	2D	00101101
120	78	# 4 8th character of name (“L”)	4C	01001100
121	79	# 4 9th character of name (“0”)	30	00110000
122	7A	# 4 9th character of name (“6”)	36	00110110
123	7B	# 4 New line character indicates end of ASCII string	0A	00001010
124	7C	# 4 Padding with “Blank” character	20	00100000
125	7D	# 4 Padding with “Blank” character	20	00100000
126	7E	Extension flag	00	00000000
127	7F	Checksum	E6	11100110

6.CONVERTER SPECIFICATION

6.1 ABSOLUTE MAXIMUM RATINGS

Symbol	Ratings
LED_VCCS	-0.3V~25V
LED_PWM	-0.3V~5.5V
,LED_EN	-0.3V~5.5V

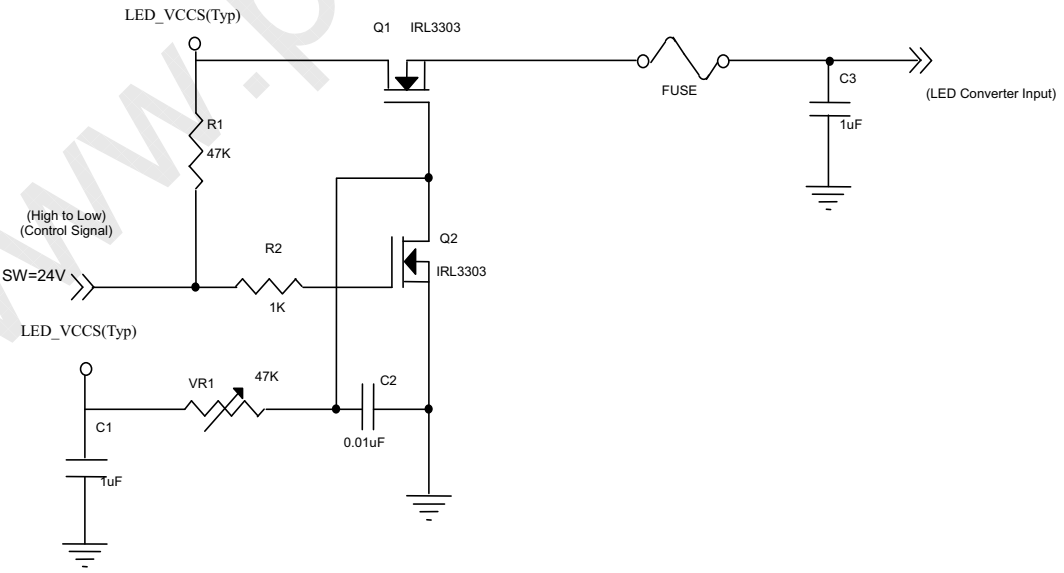
6.2 RECOMMENDED OPERATING RATINGS

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input power supply voltage		LED_Vccs	7	12.0	21.0	V	
Converter Rush Current		$ILED_{RUSH}$	-	-	1.5	A	(1)
Converter Initial Stage Current		$ILED_{IS}$	-	-	1.5	A	(1)
EN Control Level	Backlight On		2.3	-	5.5	V	
	Backlight Off		0	-	0.5	V	
PWM Control Level	PWM High Level		2.3	-	5.5	V	
	PWM Low Level		0	-	0.5	V	
PWM Control Duty Ratio			10	-	100	%	
			5	-	100	%	(2)
PWM Control Permissive Ripple Voltage		VPWM_pp	-	-	100	mV	
PWM Control Frequency		f_{PWM}	190	-	2K	Hz	(3)
LED Power Current	LED_VCCS =Min.	ILED	326	430	525	mA	(4)
	LED_VCCS =Typ.		190	251	306	mA	(4)
	LED_VCCS =Max.		114	151	184	mA	(4)

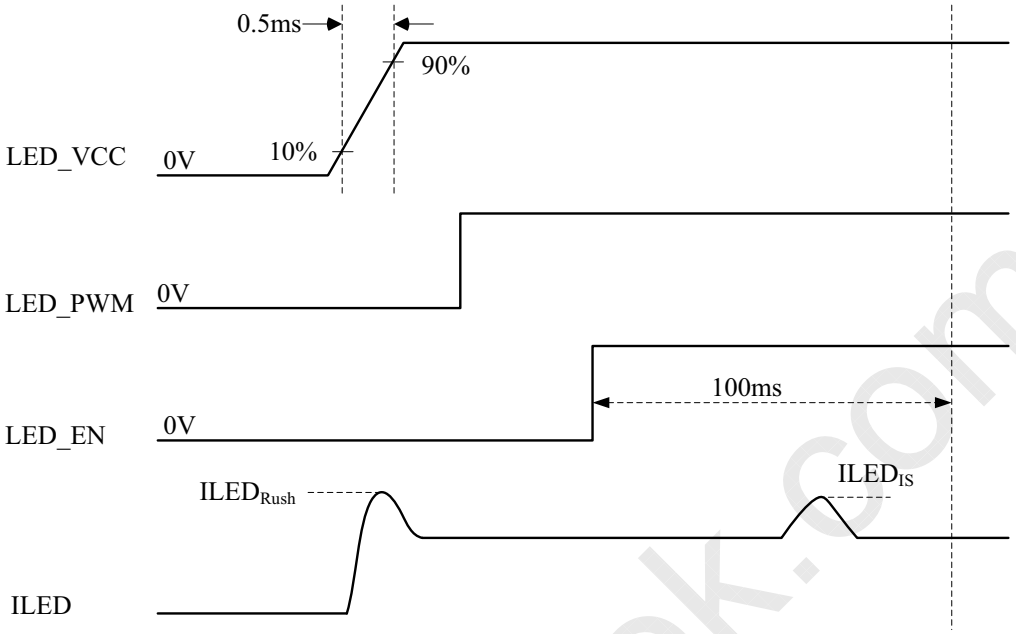
Note (1) $ILED_{RUSH}$: the maximum current when LED_VCCS is rising,

$ILED_{IS}$: the maximum current of the first 100ms after power-on,

Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 ºC, f_{PWM} = 200 Hz, Duty=100%.



VLED rising time is 0.5ms



Note (2) If the PWM control duty ratio is less than 10%, there is some possibility that acoustic noise or backlight flash can be found. And it is also difficult to control the brightness linearity.

Note (3) If PWM control frequency is applied in the range less than 1KHz, the "waterfall" phenomenon on the screen may be found. To avoid the issue, it's a suggestion that PWM control frequency should follow the criterion as below.

PWM control frequency f_{PWM} should be in the range

$$(N + 0.33) * f \leq f_{PWM} \leq (N + 0.66) * f$$

N : Integer $(N \geq 3)$

f : Frame rate

Note (4) The specified LED power supply current is under the conditions at "LED_VCCS = Min., Typ., Max.", Ta = 25 ± 2 ºC, f_{PWM} = 200 Hz, Duty=100%.

7 INTERFACE TIMING

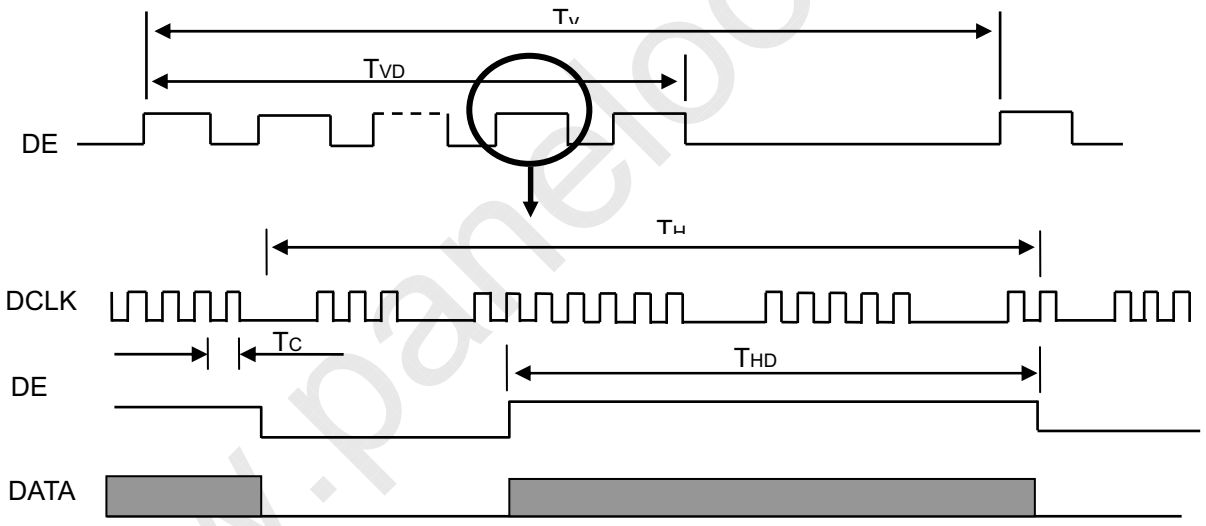
7.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

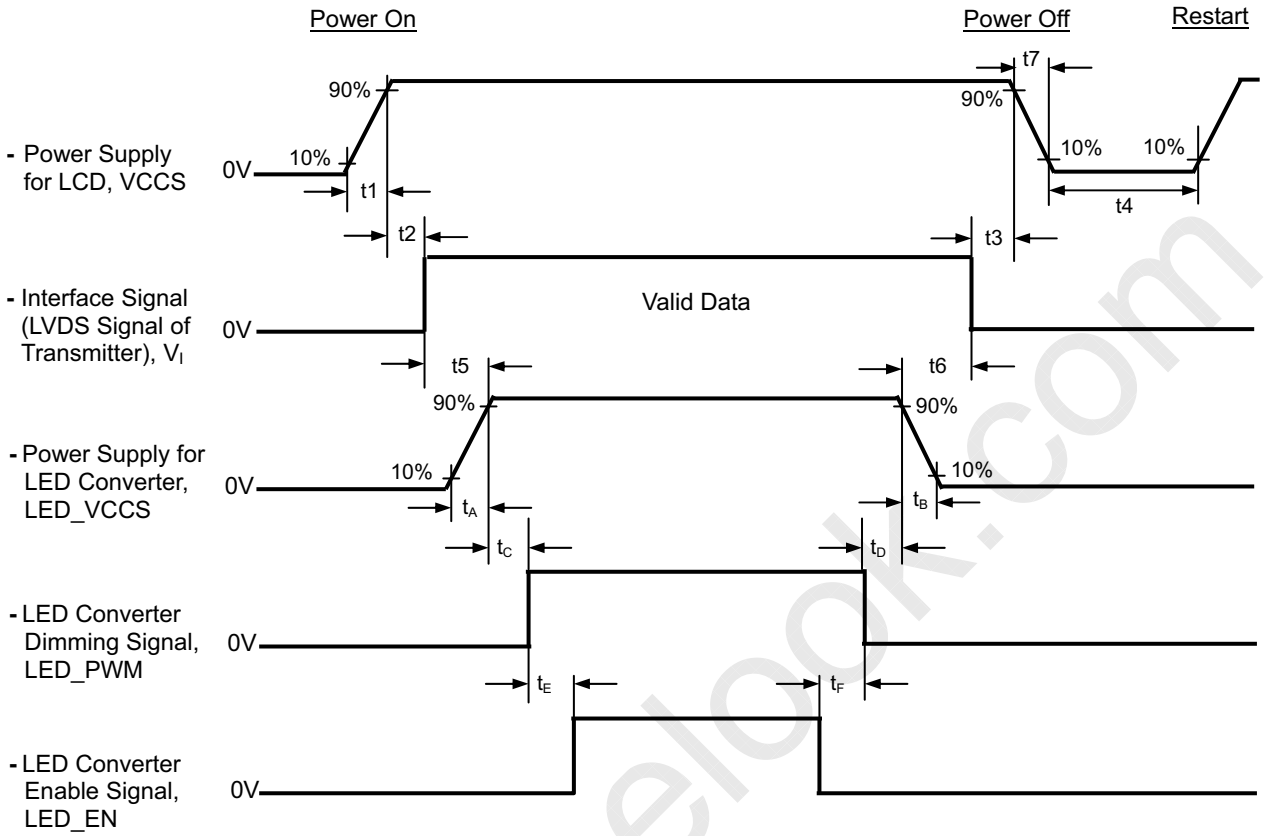
Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	50	75.44	80	MHz	
DE	Vertical Total Time	TV	771	806	1008	TH	
	Vertical Active Display Period	TVD	768	768	768	TH	
	Vertical Active Blanking Period	TVB	TV-TVD	38	TV-TVD	TH	
	Horizontal Total Time	TH	1448	1560	1950	Tc	
	Horizontal Active Display Period	THD	1366	1366	1366	Tc	
	Horizontal Active Blanking Period	THB	TH-THD	194	TH-THD	Tc	

Note (1) Because this module is operated by DE only mode, Hsync and Vsync are ignored

INPUT SIGNAL TIMING DIAGRAM



7.2 POWER ON/OFF SEQUENCE



Timing Specifications:

0.5≦t1≦ 10 ms
0 ≦t2≦ 50 ms
0 ≦t3≦ 50 ms
t4 ≧ 500 ms
t5 ≧ 200 ms
t6 ≧ 200 ms
0.5≦t7≦ 10 ms
0.5≦t_A≦ 10 ms
0<t_B≦ 10 ms
t_C ≧ 10 ms
t_D ≧ 10 ms
t_E ≧ 10 ms
t_F ≧ 10 ms

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD VCCS to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Please follow the LED converter power sequence as above. If the customer could not follow, it might cause backlight flash issue during display ON/OFF or damage the LED backlight controller

8 OPTICAL CHARACTERISTICS

8.1 TEST CONDITIONS

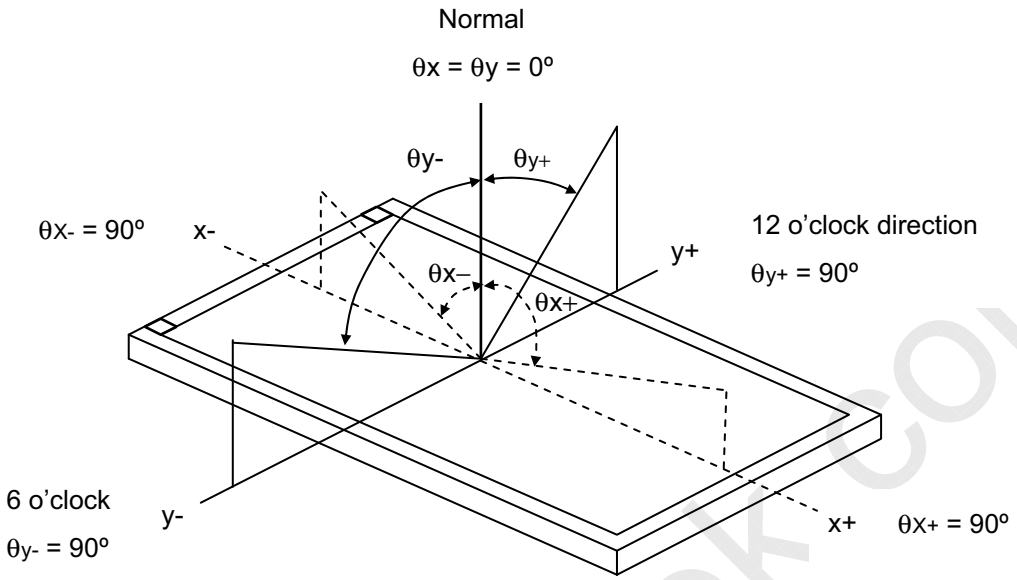
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I_L	100	mA

The measurement methods of optical characteristics are shown in Section 8.2. The following items should be measured under the test conditions described in Section 8.1 and stable environment shown in Note (5).

8.2 OPTICAL SPECIFICATIONS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle	500	650	-	-	(2), (5)
Response Time		T_R		-	3	8	ms	(3)
		T_F		-	8	13	ms	
Average Luminance of White		L_{AVE}		190	220	-	cd/m^2	(4), (6)
Color Chromaticity	Red	Rx		Typ – 0.03	0.580	Typ – 0.03	-	(1)
		Ry			0.343		-	
	Green	Gx			0.330		-	
		Gy			0.568		-	
	Blue	Bx			0.155		-	
		By			0.125		-	
	White	Wx			0.313		-	
		Wy			0.329		-	
Viewing Angle	Horizontal	θ_x+	CR≥10	40	45		Deg.	(1),(5)
		θ_x-		40	45	-		
	Vertical	θ_Y+		15	20	-		
		θ_Y-		40	45	-		
White Variation of 5 Points		δW_{5p}	θ_x=0°, θ_Y =0°	80	-	-	%	(5),(6)

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

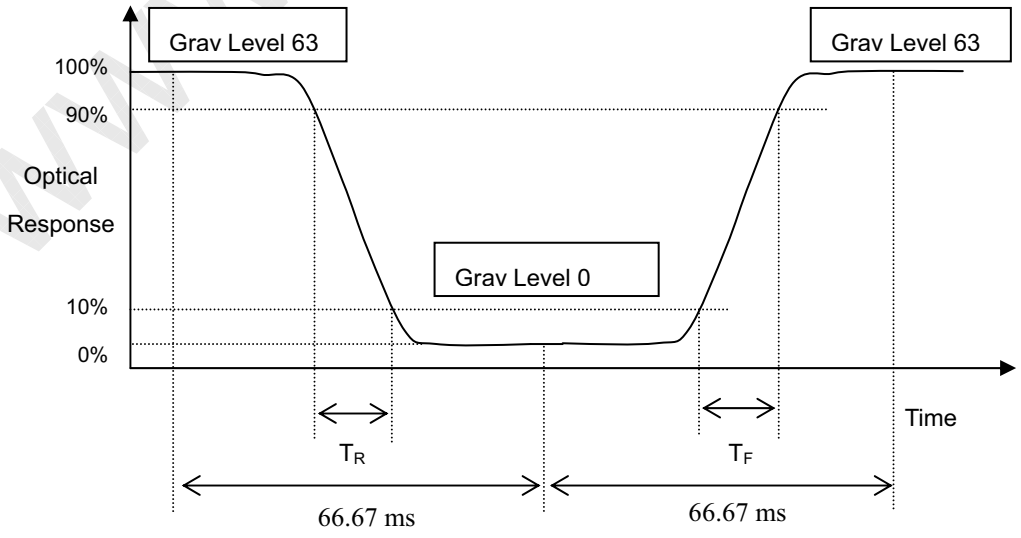
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (1)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Average Luminance of White (L_{AVE}):

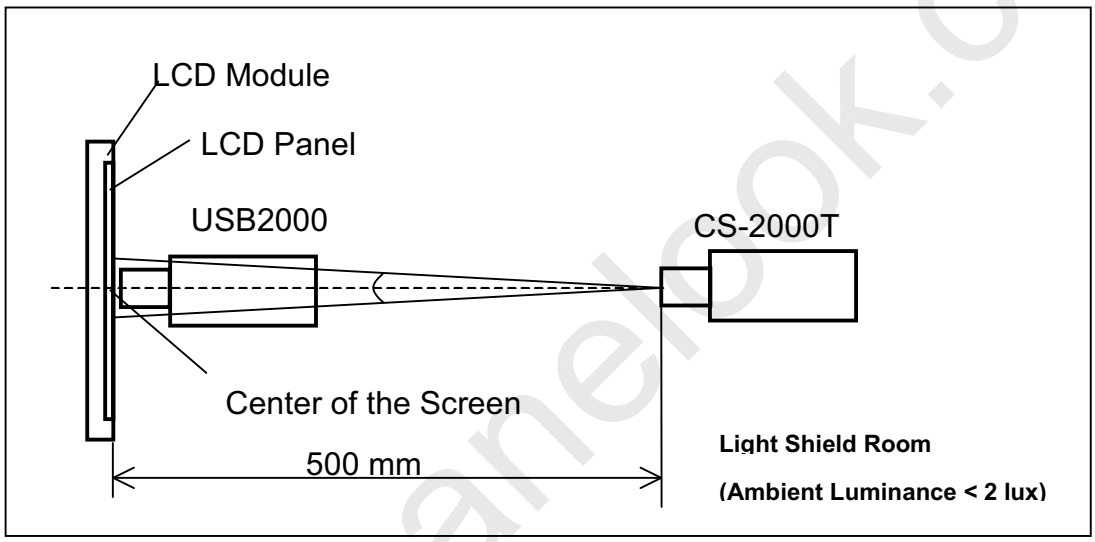
Measure the luminance of gray level 63 at 5 points

L_{AVE} = [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / 5

L (x) is corresponding to the luminance of the point X at Figure in Note (6)

Note (5) Measurement Setup:

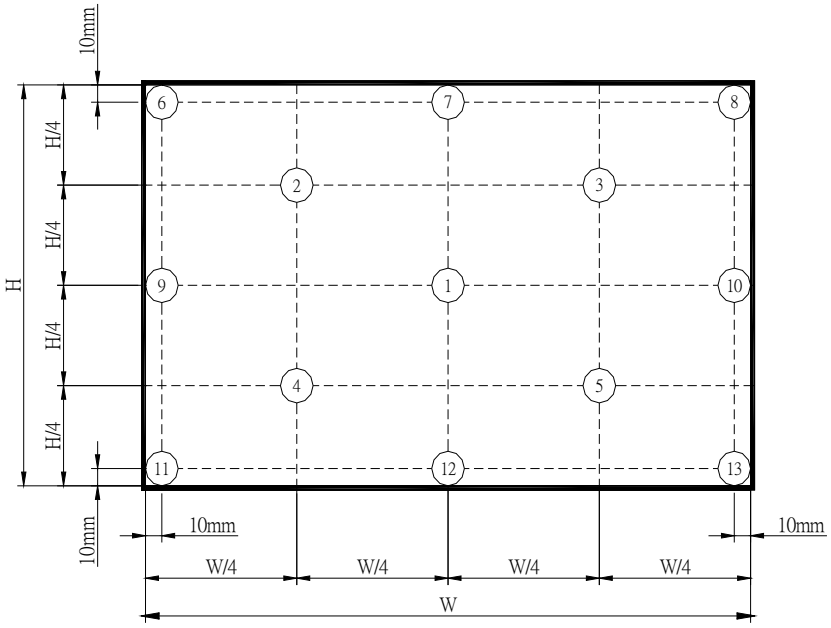
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

δW_{5p} = {Minimum [L (1)+ L (2)+ L (3)+ L (4)+ L (5)] / Maximum [L (1)+ L (2)+ L (3)+ L (4)+ L (5)]}*100%



Ⓧ : Test Point

X=1 to 13

Note (7) The listed optical specifications refer to the initial value of manufacture, but the condition of the specifications after long-term operation will not be warranted.

9 PRECAUTIONS

9.1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.

(4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.

(5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.

(6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(9) Do not disassemble the module.

(10) Do not pull or fold the LED wire.

(11) Pins of I/F connector should not be touched directly with bare hands.

9.2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slowly, and the starting voltage of LED will be higher than the room temperature.

9.3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with converter. Do not disassemble the module or insert anything into the Backlight unit.

10 PACKING

10.1 CARTON

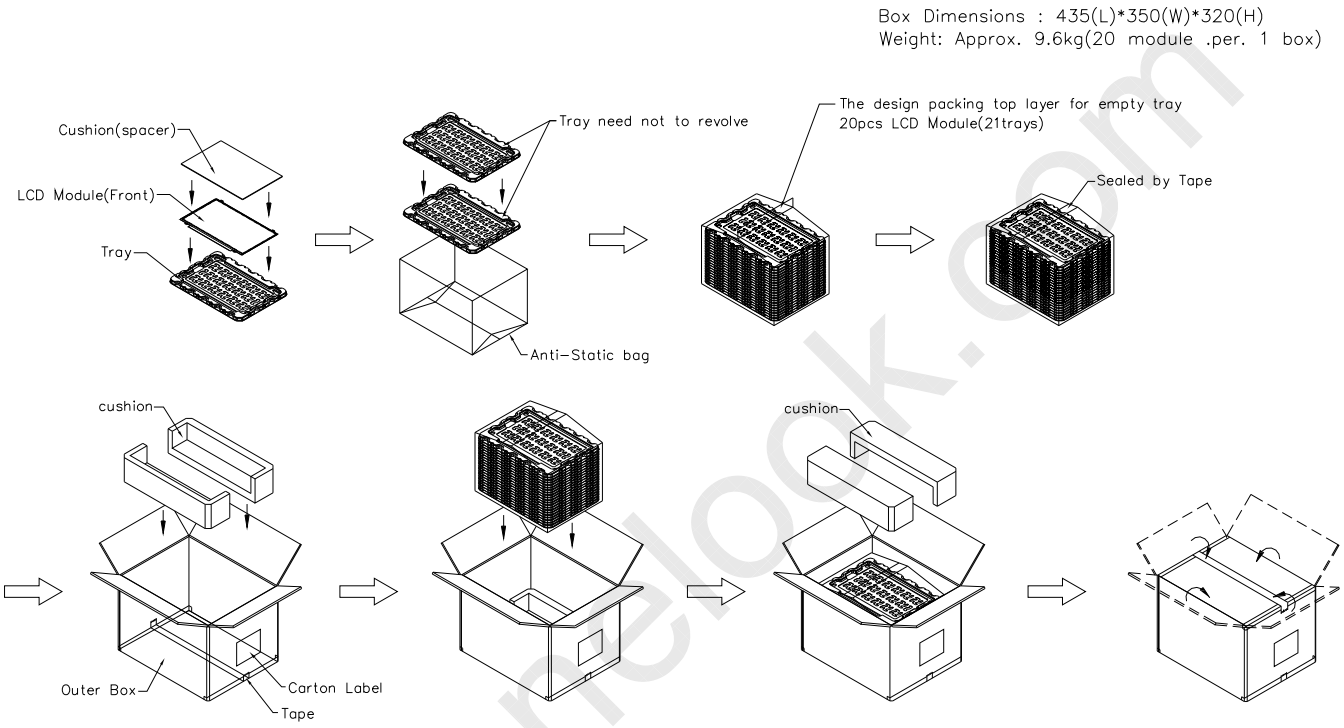


Figure. 10-1 Packing method

10.2 PALLET

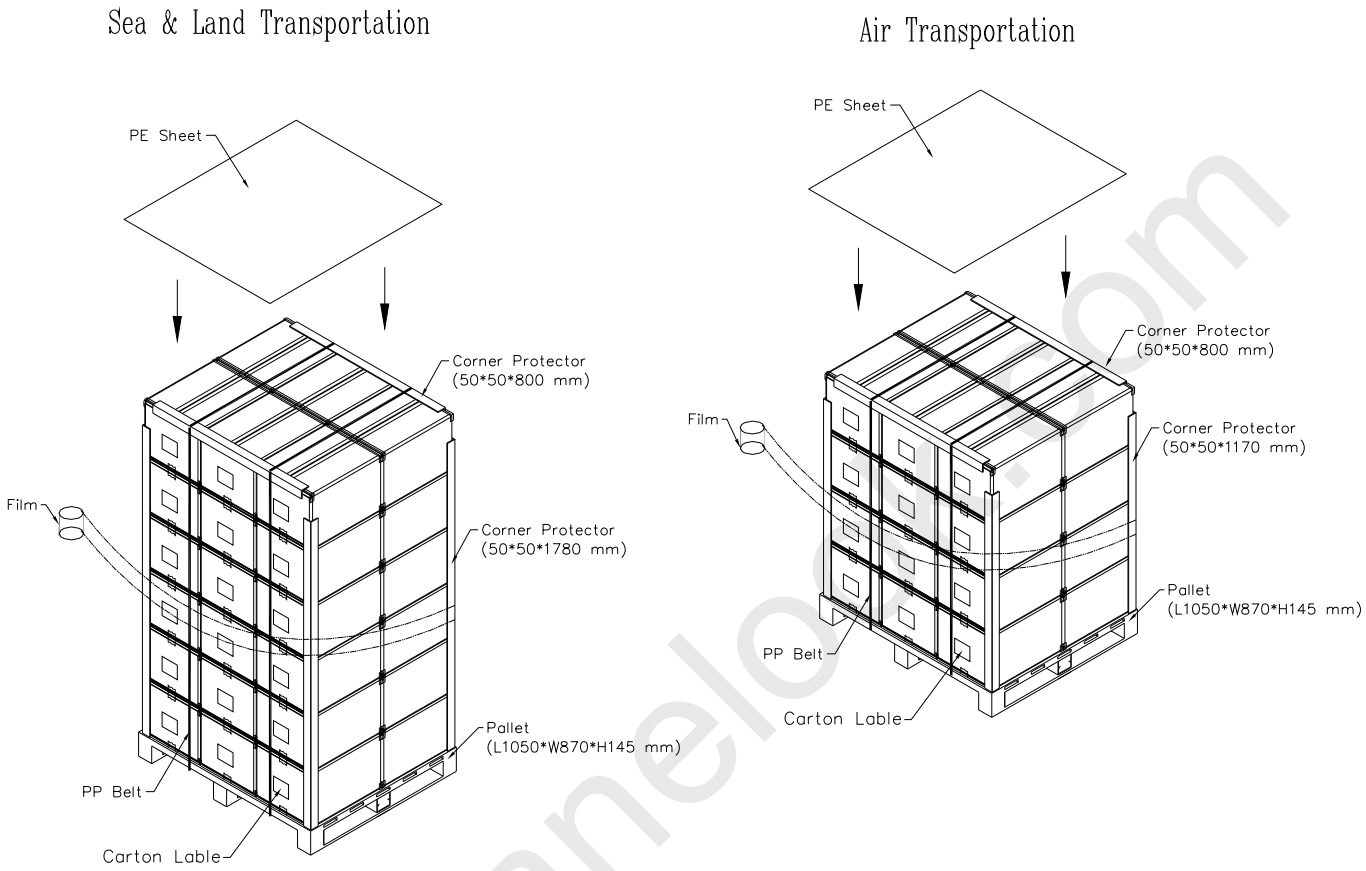
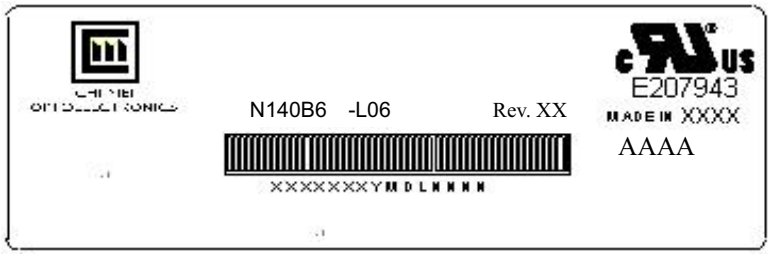


Figure. 10-2 Packing method

11 DEFINITION OF LABELS

11.1 CMO MODULE LABEL

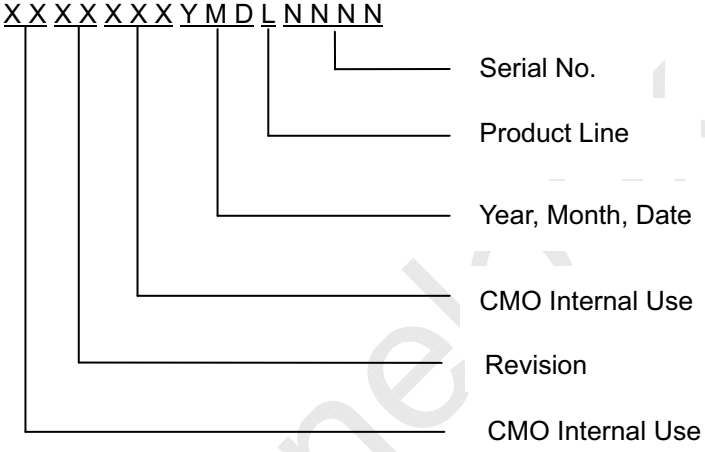
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: N140B6 - L06

(b) Revision: Rev. XX, for example: C1, C2 …etc.

(c) Serial ID: X X X X X X Y M D L N N N N



(d) Production Location: MADE IN XXXX. XXXX stands for production location.

(e) UL logo: “AAAA” especially stands for panel manufactured by CMO China satisfying UL requirement. “LEOO” and “COCKN” is the CMO’s UL factory code for Ningbo factory.

Serial ID includes the information as below:

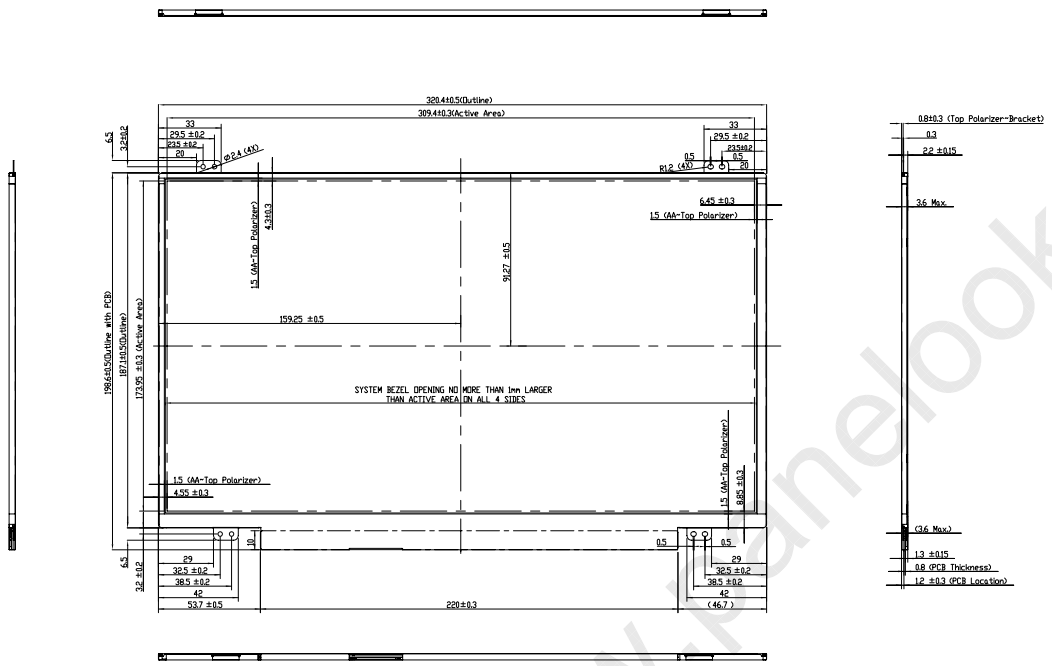
(a) Manufactured Date: Year: 1~9, for 2001~2009
Month: 1~9, A~C, for Jan. ~ Dec.
Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

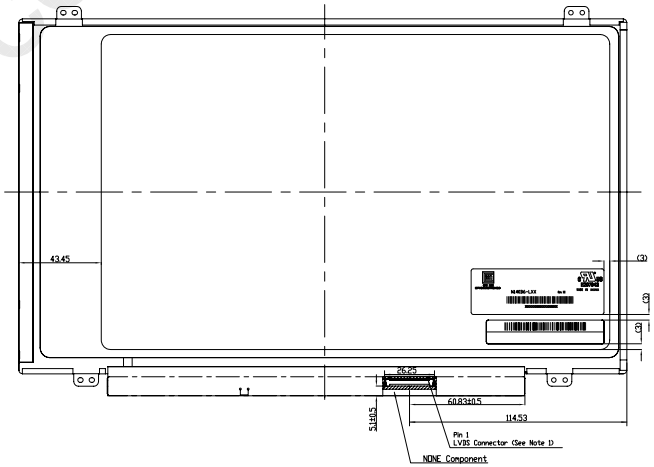
(b) Revision Code: cover all the change

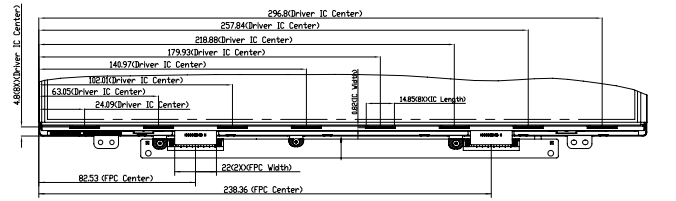
(c) Serial No.: Manufacturing sequence of product

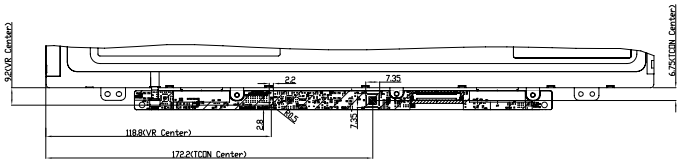
(d) Product Line: 1 -> Line1, 2 -> Line 2, …etc.

11.2 CARTON LABEL









DRIVER IC, FPC, TCON, AND VR LOCATIONS
SEE NOTE 7 FOR EXPLANATION.

NOTES:
1. LCD Module Input Connector: I-PEX 20455-040E-12, Tyco 2069716-3, or Starconn 111A40-0000RA-G3.
2. Flatness 0.5mm Max.
3. In order to avoid abnormal display, pooling and white spot, no overlapping is suggested at cables, antennas, camera, WLAN, WAN or other foreign objects over Driver IC, FPC, TCON ,and VR locations.
4. '( )' MARKS THE REFERENCE DIMENSION.

Mark	Description	Date	Changed_By	Approved_By	ECN No.	Remark

TITLE	OUTLINE DRAWING M430A-L06(909)			ID REV.	A
				MI REV.	A0
Approved	Shunnan	Drawing No.	M430A106A		
Checked	Shunnan	Part No.	NA		
Drawer	Kengshun Lin	Material	NA	Sheet	1 / 1 A0
Designer	Kengshun Lin	Date	02-Nov-2009	Scale	1:1 Unitmm

CHI MEI OPTOELECTRONICS CORP.